THE IMPACT OF INTERFACE ON STRATEGY USE AND ESL READING COMPREHENSION:

A COMPARISON OF E-BOOKS AND PAPER TEXTS

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The Impact of Interface on Strategy Use and ESL Reading Comprehension: A Comparison of E-books and Paper Texts

Since the advent of the personalized computer and its incorporation into mainstream classrooms beginning in the 1980s, computer-assisted language learning (CALL) has become an area of rapid development for language institutions. Common debates in CALL literature revolve around whether technology hinders or assists in learning, and whether the technology will play an important role in classrooms in the future. For example, some retailers in the publishing industry have forecasted that electronic books (e-books) were a novelty that would not continue to be popular in current years, but this has hardly been the case (Mac William, 2013), and the e-book market has expanded well into the realm of e-readers, smart phones, personal computers, and tablets.

E-books have made their way into post-secondary English as a second language (ESL) programs as well, but researchers have not yet reached a consensus on whether e-books benefit or hinder reading (Kang, Kress, 2003; Lam et al., 2012; Mac William, 2013; Wang, & Lin, 2009; Wilson, 2003). This ongoing conversation is the impetus for the current study, which investigates the potential impacts of e-books on ESL reading, in terms of reading comprehension, the types of reading strategies used, and the frequencies of their uses.

The ways in which the current study focused on these factors was guided by a sociocultural framework with an interactionist approach. Traditionally, interactionist theory focused on the ways in which people engage with one another using the target language; however, this approach can be used to conceptualize the ways in which one engages with a culturally constructed artifact, such as a text or an e-book, as well (Stevenson, 2013; Balegizadeh, Memar & Memar, 2011). In addition, the design of this study is guided by

Appropriation Theory (Papadima-Sophocleous & Charalambous, 2014), which describes the ways in which an innovative artifact, such as an e-book, is foreign to a person until it is adopted and incorporated into one's life. In the case of the current study, the ways in which learners appropriated the e-book to suit their own reading purposes was measured in terms of how the e-book users' reading comprehension and strategy uses compared to those who read with traditional, paper texts.

The current study measures reading comprehension using pre-, post-, and delayed post-tests. Reading strategies are measured in terms of global reading strategies, problem-solving strategies, and primarily support strategies (Mokhtari & Sheorey, 2002), as the latter are utilized by readers in fundamentally different ways when reading with an e-book interface.

The structure of this paper is as follows: First, a literature review will detail ESL reading comprehension; ESL vocabulary acquisition through reading; ESL reading strategies; e-texts, e-books, and how they affect ESL reading; and the research questions and hypotheses. After that will be a description of the current study: its methodology, results, discussion, implications, limitations, and conclusion.

ESL Reading Comprehension

Reading comprehension is "an interactive mental process between a reader's linguistic knowledge, knowledge of the world, and knowledge about a given topic" (Rahmani & Sadeghi, 2011, p. 116). Academic reading ability—whether in an L1 of L2—is considered to be one of the most essential skills for university students (Chou, 2012). ESL reading comprehension is affected by many factors, such as proficiency level, specific reading skills, and reading purpose (Evans, Hartshorn, & Anderson, 2010). The purposes for which one reads also affect reading comprehension; three commonly accepted purposes are reading for comprehending (i.e.,

understanding the meaning), reading for remembering (i.e., studying the content), and reading for decoding (i.e., for the purposes of language learning), all of which are interrelated and vary depending on the context in which someone is reading, their reading goals, and their interests (Smith, 1982). Furthermore, reading requires a multitude of skills, such as drawing on background knowledge and applying it to the passage, using a variety of cognitive and metacognitive skills, accessing vocabulary and grammar, and making lexical inferences. Many obstacles can interfere with a reader's successful understanding of the text, such as the strategic processing of a text (Gersten, Williams, Fuchs, & Baker, 2001) or an electronic text (e-text) (Anderson, 2003; Chou, 2012; Huang, 2013b; Huang et al., 2009; Murphy, Long, Hollerman, & Esterly, 2003; Reinking & Rickman, 1990),-as will be elaborated in the following sections.

L2 Vocabulary and Reading Comprehension

Vocabulary knowledge is essential for effective L2 reading comprehension. In order for ESL learners to be able to successfully comprehend a range of authentic English texts, they need to have an extensive knowledge of English vocabulary, approximately 8,000 – 9,000 word families; these include the word forms, meanings, and uses (Nation, 2006). In addition, in order for L2 readers to be able to comprehend a text effectively enough to infer the meaning of new vocabulary terms, readers should be familiar with at least 95% of the words in the passage (Liu & Nation, 1985). That is, if the reader is unfamiliar with more than 5% of the words in a reading passage, reading comprehension and vocabulary acquisition will be negatively impacted.

Reading with e-books may assist vocabulary learning. With e-books, learners are able to look up the definition and translation of a word by tapping or clicking on the screen. Such seamless presentation of vocabulary information allows for minimal interruption of reading rate; this, in turn, allows students to better comprehend the passage and the new vocabulary within it

(Nation, 2013). Another feature of e-books applications such as Kindle® is that when readers tap on a word, they are able to elaborate on its meaning, because the e-book automatically provides entries for the word from Wikipedia or other sites. Elaboration is a feature of intentional vocabulary learning (Dijab, 2011) and it also enhances vocabulary learning (Nation, 2013). Furthermore, L2 learners who use e-book applications such as Kindle® are able to highlight new vocabulary words, and thereby have additional opportunities for review, because the "review" feature automatically supplies a list of all notes taken and words highlighted. This intentional, repeated exposure to the new terms such as this leads to greater retention of the words (Nation 2015).

In order for reading comprehension to occur, learners must decode the textual information, and the ways in which learners decode textual information relies, in part, on their L1s (Koda, 1998). Koda claimed that learners with L1s that are alphabetic (such as Korean or Arabic) tend to use the same decoding and phonological processing skills for English as they do for their L1. Learners with L1s that are ideographic (such as Chinese), match the form of a character with meaning and tend to rely more on orthographic information than phonological information (Wang, Koda, & Perfetti, 2003); therefore, they are faced with the task of learning new processing skills when they learn to read an alphabetic language such as English (Koda, 1998).

Regardless of learners' L1s, a common practice among instructors in in many ESL institutions is to not allow students to use their L1s while in the classroom. Policies such as these are common in communicative language learning environments, and they have empirically-backed justification. For example, Joyce (2015) found that English language learners performed best on English vocabulary tests when the language used in while studying matched the language

used in the test. These findings indicate that using English only while studying ESL is the most effective method for learning the language, especially at intermediate or advanced levels.

Despite these findings, Joyce (2015) admitted that using the L1 is preferable for vocabulary expansion. One such method for providing L1 assistance to students is to use e-books that offer L1 translations to new vocabulary items the students encounter in their reading passages. These suggestions align with other psycholinguistic research, which has found that across proficiency levels, L1 activation occurs during L2 vocabulary processing due to L1 word-mapping (Jiang, 2002; Sunderman & Kroll, 2006; Ringbom, 1987; Swan, 1997). Others (Scott & De La Fuente, 2008) have found that using an L1 during L2 vocabulary learning should not be seen as a hindrance, as it can reduce the time required to learn L2 vocabulary, which is due to the L1/L2 meaning overlap in mind-mapping, especially in the initial stages of learning L2 vocabulary meaning.

ESL reading strategies

Reading strategies are the tactics learners use in order to achieve their reading goals, such as setting a goal for reading, or underlining unfamiliar words. In general, ESL readers use a greater range of them than native-English speakers do, which indicates that reading strategies are very important to them (Sheorey & Mokhtari, 2001; Mokhtari & Sheorey, 2002). Adult ESL learners actively use reading strategies (Huang & Nisbet, 2014), and skilled ESL readers use a great variety of cognitive and metacognitive reading strategies with high frequency (Mokhtari & Sheorey, 1994).

Not surprisingly, when ESL students use reading strategies, they make gains in reading comprehension (Huang, Chern, & Lin, 2009). For that reason, many L2 reading experts (e.g., Anderson, 2003; Oxford, 1990; Mokhtari & Reichard, 2002; Sheorey & Mokhtari, 2001;

Mokhtari & Sheorey, 2002) have created taxonomies of what they have found to be the most effective L2 reading strategies, yet they present different findings about which strategies are most beneficial or which ones are most frequently used. Some studies (Huang & Nisbet, 2014) found that high-intermediate ESL learners use the most strategies, while others (Sheorey & Mokhtari, (2001) found that advanced learners use the greatest range of strategies.

A very influential classification of ESL reading strategies comes from Mokhtari and Sheorey's (2002) *Survey of Reading Strategies* (SORS). The SORS instrument divided reading strategies into three main categories: global strategies, problem-solving strategies, and support strategies. Because this is the classification adopted for purposes of the current study, a discussion of each category is warranted. Mokhtari and Sheorey define *global strategies* as "intentional, carefully planned techniques by which learners monitor or manage their reading" such as trying to predict what will happen next in the reading or having a purpose or goal in mind when reading (Mokhtari & Sheorey, 2002, p. 4). Huang et al.'s (2009) description of monitoring one's progress towards that goal can be included in this category as well. In addition, they are similar to Oxford's (1990) classification of cognitive, metacognitive, affective, and social learning strategies. Some research has found that higher-proficiency ESL readers tend to use more global strategies than lower-proficiency ESL readers (Iwai, 2011; Upton, 1997), who tend to rely on local and cognitive strategies (Upton, 1997). However, not all research in this field aligns with these findings, the details of which are mentioned below.

Problem-solving strategies are "actions and procedures that readers use while working directly with a text; these are localized, focused techniques for use when problems develop in understanding textual information" (Mokhtari & Sheorey, 2002, p. 4). They include strategies such as guessing the meaning of unknown words, reading a passage slowly, or rereading a

passage to ensure comprehension, and are similar to Oxford's (1990) classifications of compensatory and memory-related learning strategies. Zhang (2001) states that these strategies are often used more by advanced-proficiency learners of English than they are by beginning-proficiency learners, his reasoning being that advanced learners are more aware of their strengths and weaknesses in reading and reading strategies.

Support strategies are "basic support mechanisms intended to aid the reader in comprehending the text, such as using a dictionary, taking notes, underlining, or highlighting textual information" (Mokhtari & Sheorey, 2002, p. 4). ESL students use support strategies very often; in fact, they use a greater number of them than native-English speaking students do (Mokhtari & Sheorey, 2002). Support strategies have been found to be the strategy used most frequently by EFL learners; furthermore, they have been found to contribute to the most gains in reading comprehension (Huang et al., 2009). Huang and Nisbet (2014) found that support strategies are used in especially high frequency with beginning and intermediate proficiency ESL learners and that problem-solving and support strategy use was most indicative of high reading proficiency. Although teachers report that global strategies are the most useful in achieving reading proficiency gains, students (especially students who are not high-proficiency) actually report using more support strategies than global ones (Huang, 2012).

E-texts and E-books

Some research suggests that student preference for electronic texts is increasing (Mercieca, 2003). Digital libraries are becoming exceedingly common, and book publishers are allowing registered users to buy and loan digital books and access them from their own computers (Kol & Schcolnik, 2000). Also, e-books are often more affordable than traditional texts. As a result, e-book use is becoming a common practice among students, who typically

require many books for their academic classes each year (Miller, 2014). Even if students report that they do not prefer e-books, they use them because they find them to be necessary or much more practical, especially at the graduate level, where students' reading load increases (Chou, 2012). Despite these findings, the field of study regarding how reading with e-books impacts L2 students in academia is very limited (Anderson, 2003).

The Impacts of E-texts and E-books on L2 Reading

Just as the predictions about the fate of e-books in academia are mixed, so are the findings regarding the impacts of e-books on L2 reading. Some scholars such as Horning (2003) argue that reading with e-texts is not as different from reading traditional texts as many experts in the field suggest it to be because the two interfaces have many similarities. Similarly, Kol and Schcolnik (2000) find there is no difference in reading comprehension when ESL students read e-texts or paper texts. These findings seem to be in the minority, however, as many other scholars (Kang, Wang, & Lin, 2009; Kress 2003; Mac William, 2013) argue that reading from an electronic interface is completely different than reading from a paper text. Mac William (2013) writes, "The e-book reading experience is essentially two-fold: device and contents" (p. 9).

Among those who argue that reading with an e-book is different from reading a paper text, there exists disagreement about whether the e-books benefit or hinder the reading experience. For instance Lam et al. (2012) claim that e-books are less effective for L2 reading, citing lower comprehension scores for the e-book participants compared to the paper text participants. On the other hand, Papadima-Sophocleous, Georgiadou, and Mallouris (2012) found that the use of an e-book improved the oral reading fluency of university English for specific academic purposes students, yet it is worth noting that oral reading fluency cannot be equated with strategy use or reading comprehension.

The research investigating the e-book reading strategies of ESL/EFL learners is limited and has mixed findings as well. Some studies conclude that reading strategies manifest themselves in similar ways with e-books and traditional texts (e.g. Anderson, 2003; Huang et al., 2009). Others, such as Chou (2012) found that L2 matriculated graduate students who read e-texts used more skimming and scanning strategies than those who read traditional texts, thanks to the "search" feature in the Adobe PDF application, but that overall, "[the students] believed that reading screen-based texts limited their use of strategies" (p. 411).

Regarding global strategies, Anderson (2003) has found that they are used similarly in both ESL and EFL environments when students read on computer screens. This finding demonstrates that some strategies that require higher-level thinking instead of simpler forms of text manipulation will not change significantly between e-books and traditional texts. One caveat to this involves the behavior of taking notes (e.g.: notes on the macro elements of the text, one's predictions, or one's self-monitoring) because note-taking is an available feature of the Kindle® e-book and would require the input to be typed or written with a stylus rather than handwritten.

Concerning problem-solving strategies, some research has found that these strategies are the ones most commonly used by L2 readers who are reading on computer screens. These strategies are implemented differently in e-books compared to paper texts in that one can use a finger or mouse to scroll across the screen or change the size of the text. However, there is less difference in the ways that problem-solving strategies are implemented between interfaces than there is with support strategies.

Turning to referencing support strategies, Reinking and Rickman (1990) found that students who use e-texts are much more likely to use certain support strategies, such as looking

up definitions, than students who use traditional paper texts. Other research suggests that L2 students use support strategies much more frequently when reading e-texts, such as copy-and-paste strategies (Chou, 2012), using an English or bilingual dictionary (Huang et al., 2009; Huang, 2013b), or highlighting (Huang, 2013b). Huang et al. (2009) found that support strategies dominated the strategy use and contributed to the most comprehension gains in EFL learners, but that other strategies, such as global strategies, were also necessary for students to make gains in reading comprehension.

Unlike problem-solving strategies and global strategies, support strategies are clearly executed in different ways while reading an e-book or a traditional text. When using an e-book with a touch screen, the reader can tap and hold on words in order to take notes, bookmark, underline, highlight, translate, define, or perform web-searches related to the word. Readers can use their fingers, a mouse, or a stylus to perform these actions. Many researchers (Anderson, 2003; Chou, 2012; Murphy, Long, Hollerman, & Esterly, 2003) have suggested that reading electronic texts poses new support and new challenges that affect reading comprehension, and a common suggestion in this literature is for L2 instructors to teach e-text reading strategies as distinct from paper-based reading strategies.

The current literature illustrates that there may be a difference regarding the impacts of e-books and paper texts on L2 reading comprehension and strategy use. What is not yet clear, however, is exactly what is different, how it is different, and why it is different. Previous studies, such as Chou (2012) or Anderson (2003) focused on either matriculated graduate students or utilized applications that are limited in their functions and out-of-date. In the past, researchers have gathered strategy use data though surveys alone (Anderson, 2003; Zhang, 2001). For these reasons, the use of support strategies by intermediate ESL students who read

with contemporary e-books is worthy of further investigation. In addition, the current study is unique in that it will utilize observations and surveys in order to triangulate data.

Research Questions

1. Is there a difference in demonstrated reading comprehension for high-intermediate level ESL learners when they read using e-books compared to when they read using traditional texts?

I expect that the reading comprehension of ESL learners who read using e-books will be similar to the reading comprehension of ESL learners who read using traditional texts, contrary to Kang, Wang, & Lin (2009), Kress (2003), Lam et al. (2012), Mac William (2013), and Wilson (2003). I predict that e-books will not affect reading comprehension significantly because the literature does not have consistent findings about its effects.

2. Is there a difference in the *types* of support strategies that ESL learners use when they read with e-books compared to when they read with traditional texts?

I expect that, compared to reading with traditional texts, reading with e-books will not affect the types of support strategies that ESL readers use because the four types of support strategies investigated in the current study are able to be implemented in both types of reading interfaces (as will be described in "Methodology").

3. Is there a difference in the *frequency* of support strategies that ESL learners use when they read with e-books compared to when they read with traditional texts?

I expect that the e-book-reading participants will use a greater frequency of some support strategies, such as looking up words in the dictionary and bilingual dictionary, following Huang et al. (2009), Huang (2013b), and Reinking & Rickman (1990), as compared to ESL learners who read with traditional paper-based texts.

Methodology

Participants

The participants (n = 22) were ESL learners in high-intermediate classes (level 4) in a Midwestern university's intensive English program (IEP). All of the participants were full-time students. According to their self-reported demographic information, the participants consisted of 13 males and 9 females, from the ages of 18 – 27 (M = 21.14, SD = 2.77). Their first languages (L1) were Arabic (n = 6) and Chinese (n = 16). Participants, on average, spent less than a year (M = 0.57, SD = 0.64) in an English-speaking country, ranging from one month to 2 ¼ years; however, their comparative time spent studying the English language ranged from eight months to 21 years (M = 8.28, SD = 5.66). The majors they intended to pursue once matriculated varied, including telecommunications, business, special education, computer science, etc. The participants were randomly assigned to two groups: a traditional paper text group (n = 11) and an e-book group (n = 11).

Materials

The materials used for both groups include a demographic survey (See Appendix A); a reading comprehension test administered via Google Forms (See Appendix B); Strategy mini-lessons (See Appendices C and D); a reading passage (viewed on different interfaces) (See Appendices E and F); a handout on which the research assistant could take observation notes (See Appendix G); and post-reading surveys which utilized metalinguistic retrospective think-aloud (See Appendices H and I). This survey method requires verbalization after reading and is one way to reveal what cognitive and metacognitive processes learners go through while reading (Bowles & Leow, 2005).

The reading passage used for both groups was a section of "Bananas for Bananas," from *Practice makes perfect: Intermediate English reading and comprehension* (2013). This passage was selected in light of Krashen's (1982) *i + 1* theory and because it was deemed appropriate by ESL instructors. The reading passage consisted of 348 words, requiring four e-book pages (with standard font size) (See Appendix F), or one 8.5"x11" page of paper text (See Appendix E). Neither the e-book version of the text nor the paper version of the text had images or margin information; each had only headers, paragraph numbering, and bolded vocabulary terms. For the e-book group, the e-book default font was black Helvetica 12 pt. font, 1.5 spacing, on a white background. For the traditional paper text group, the traditional text passage font was black Cambria 12 pt. font, 1.5 spacing, on white paper.

The test used in this study was adapted from the same textbook as the reading passage (Engelhardt, 2013), and it was adapted so that the questions reflected the section of the reading passage that was used for the study. It consisted of five true/false and five multiple-choice questions about the main ideas and supporting details of the text (See Appendix B). This test was used for the pre-test, the post-test, and the delayed post-test.

The additional materials for the traditional paper text group consisted of writing utensils (highlighters in orange, pink, and yellow, pens in blue, black, and purple, and a n.o. 2 pencil with an eraser); a traditional English dictionary (Stevenson & Waite, 2011), a traditional Chinese-English bilingual dictionary (Manser, 1999); a traditional Arabic-English bilingual dictionary (Doniach, 1972); and a survey about reading comprehension, strategy use, and affect regarding the traditional text administered via Google forms (See Appendix H), which was part of a larger study.

The additional materials for the e-book group consisted of a survey about reading comprehension, strategy use, and affect regarding the e-book text administered via Google forms (See Appendix I), which was part of a larger study.

The e-book reading passage was displayed on an Amazon Kindle®. The device on which the e-book was read was an Apple iPad iOS® 9.1, Model A1416, version 9.0.2 (13A452). The device had a touch screen that allowed users to use their fingers to zoom, scroll, type, and tap on words to use the reading strategies mentioned above. The device also used a wireless ZAGG® keyboard which also allowed the participants to type notes if they chose to do so.

Procedure

The procedure consisted of two sessions during which the research assistant met with each participant one-on-one. The sessions were designed so that there were no time-requirements, as I believed that it may compromise the reading comprehension, strategy use, and/or strategy frequency, and survey responses provided by the participants.

Session 1

First, the participants gave consent following IRB procedures. Then, the research assistant collected their information using the demographic survey (See Appendix A). For purposes of ease of data collection, the research assistant read the questions and typed the participants' responses while showing them the survey. The participants checked it for accuracy before it was submitted.

Next, the pre-test was administered the participants before they viewed the reading passage. The purposes of the pre-test were to ensure that the participants had not previously read the passage and to collect a baseline measurement of their scores against which to compare their post-test and delayed post-test scores.

After the pre-test, the participants were given mini-lessons on how to use reading strategies using the traditional text or the e-book reading passage. This step in the methodology was different for each group, as the interface from which they read differed. The participants were familiar with support strategies from their IEP classes, so the research assistant did not explicitly teach them; rather, the research assistant instructed the participants on how to implement them using either the traditional paper text group materials or the e-book group materials.

During the strategy lesson for the paper text group (See Appendix C), the participants were given a paper copy of the text (See Appendix E), writing utensils, highlighters, an English dictionary, and a bilingual dictionary, and they were reminded of how to use support strategies. The method of the lesson plan consisted of the research assistant prompting the participant to perform each support strategy (highlighting/underlining/circling [HUC], English dictionary use, bilingual dictionary use, and note-taking) through guided practice. The participants were informed that they could mark the text because their papers would not be reused.

During the strategy lesson for the e-book group, the research assistant gave a lesson on how to implement reading strategies using the e-book interface (See Appendix D). The objectives of the mini-lesson were to ensure that each participant was familiar with the e-book's interface and for the participants to successfully demonstrate the ability to scroll through the text, highlight the text, take notes with the "comment" feature, review one's highlighted text and notes through the "review" function, use the English dictionary, and use the bilingual dictionary, change the background color of the text, and change the font size (See Appendix J for sample screen shots). The ability to change the background color and the font size were part of a larger

study. The method of the lesson plan consisted of the research assistant prompting the participant to perform strategy through guided practice.

After the strategy mini-lessons, the participants in each group were instructed to read the text. They were informed that they could take as much time as they wanted to read the passage, and that they would not be able to refer to the passage when they took the post-test. The participants were not permitted to use other materials, such as personal smart phones, during the study. While participants read the text, the research assistant collected observer notes on the participants' engagement with the text (See Appendix G).

The post-test was administered to the participants during Session 1 immediately after the participants reported that they had finished reading the passage. After the participant completed the post-test, the research assistant administered the post-survey. The paper text group's Google Forms post-survey included 16 multiple-choice, yes/no, or short answer items (See Appendix H) about strategy use, history of e-book use, and preferences related to using an e-book. The e-book group's post-survey used similar questions but had a slightly different format to account for the use of e-books (See Appendix I). The research assistant asked the questions and typed the answers while the participants viewed the form. The participants checked the forms for accuracy before submitting them.

After the participants had completed the post-tests and post-surveys, the research assistant collected the traditional text reading passages and took screen shots of the e-book passages. This was done so that I had evidence of the ways in which the participants used support strategies or otherwise visibly interacted with the texts; this data would be triangulated with the participants' self-reported strategy uses from the post-surveys and the research assistant's observation notes.

Session 2

One week after Session 1, each participant met with the research assistant one-on-one for Session 2, during which the participants took the delayed post-test without reviewing the passage.

Figure 1:
Order of events for both groups

Session 1	IRB consent form Demographic survey Pre-test Strategy lesson (E-book or traditional paper text) Reading passage (with observation) Post-test Post-survey
Session 2 (one week later)	Delayed post-test

Coding and Analysis

Coding support strategy use

I reviewed the individual paper-based reading passages of each participant and counted each instance of highlighting, underlining, and circling the text. I defined an instance of highlighting/underlining/circling (HUC) as an area of text marked by the beginning and end of a HUC, i.e., if the participant highlighted, underlined, or circled multiple words in a single, continuous way, then that was counted as one instance of HUC. Likewise, if a participant highlighted, underlined, or circled one character, then that was also counted as one instance of HUC. Similarly, I reviewed the screen shots of the e-book group reading passages, and counted each incidence of highlighting (The "underline" and the "circle" features are unavailable in the e-book used in the current study).

I reviewed the individual paper-based reading passages of each participant and counted each instance of note-taking. I defined an instance of note-taking as any characters, symbols,

shapes, numbers, or figures the participant wrote on the paper that were not otherwise counted as HUC. Likewise, I reviewed the e-book screen shots for instances of note-taking. The researcher counted one instance of note taking as indicated by the "note" symbol that appears in the area in which the note was taken. Whether the participant wrote multiple words or only one character within a note, it was counted as one instance of note-taking.

The research assistant counted instances of English dictionary use and bilingual dictionary use while observing each participant as he or she read the passage and marked them on the observation form.

Coding the pre-test, post-test, and delayed post-tests

The participants' responses on the pre-test, post-test, and delayed post-test were coded in the following way. The test was worth 15 possible points. It contained five true/false questions which were weighed at one point each (total of five points), and five multiple-choice questions (with four possible answers: a, b, c, or d) which were weighed at two points each (total of 10 points). Answers were given full point value if the participant selected the correct answer; there were no partial points awarded. The participants' total scores from each group were used for analysis.

Coding the post-surveys

For both groups, the close-ended questions were coded as "yes/no/not sure" and the open-ended questions were coded qualitatively by recurring themes, such as "convenient," "eye strain," "reading the first sentence of a paragraph," "easy," "fast," "helped me remember," "read the first sentence of each paragraph to guess the topic," "difficult to mark words," etc.

Analysis

I conducted three independent-samples t-tests to compare background knowledge, reading comprehension, and retention of the reading passage material between the paper text group and the e-book group.

Results

Reading comprehension results

The total score possible on the reading comprehension test was 15. The average pre-test score for the paper text group was 6.09 points (*SD* = 1.92). The average post-test score for the paper text group was 11.09 points (*SD* = 4.13). The average delayed post-test score for the paper text group was 8.27 points (*SD* = 3.29). The average increase made from the pre-test to the post-test for the paper text group was 5.00 points. The average loss that occurred from post-test to delayed post-test for the paper text group was 2.82 points (See Table 2).

Table 2
Pre-test, post-test, and delayed post-test scores for the paper text group and the e-book group

	Pre-test	Post-test	Delayed post-test
Paper text *M*	6.09	11.09	8.27
Paper text *SD*	1.92	4.13	3.29
E-book *M*	4.27	8.91	8.27
E-book *SD*	2.15	2.12	3.47

In comparison, the average pre-test score for the e-book group was 4.27 points (*SD* = 2.15). The average post-test score for the e-book group was 8.91 points (*SD* = 2.12). The average delayed post-test score for the e-book group was 8.27 points (*SD* = 3.47). The average increase made from pre-test to post-test for the e-book group was 4.64 points. The average loss made from post-test to delayed post-test for the e-book group was 0.64 (See Table 2).

An independent-samples *t*-test was conducted to compare background knowledge in the reading topic (as measured by the pre-test) between the paper text group and the e-book group

(See Appendix K). There was a significant difference in the pre-test scores for the paper-based group (M = 6.09, SD = 1.92) and the e-book group (M = 4.27, SD =2.15); t = 2.09, p = 0.49.

Another independent-samples t-test was conducted to compare reading comprehension (as measured by the post-test) between the paper text group and the e-book group (See Appendix L). There was not a significant difference in the post-test scores for the paper-based group (M = 11.09, SD = 4.13) and the e-book group (M = 8.91, SD = 2.12); t = 1.56, p = 0.14.

A final independent-samples t-test was conducted to compare text retention (as measured by the delayed post-test) between the paper text group and the e-book group (See Appendix M). There was not a significant difference in the delayed post-test scores for the paper-based group (M = 8.27, SD = 3.29) and the e-book group (M = 8.27, SD = 3.47); t = 0.00, p = 1.00.

Support strategy use results

First I will present the support strategy use results from the paper text group, then the e-book group. After that, I will compare the two groups.

Paper text group support strategy use

Table 3
Results for total incidences of support strategy use for the paper text group and the e-book group.

	Total	*M*	*SD*
Paper text group	262	23.82	18.30
E-book group	160	14.55	15.49

The total incidences of support strategy use for the paper text group was 262 (M = 23.82, SD = 18.30) (See Table 3). Participants varied in their support strategy use, from zero to 57 instances. Ten paper text group participants used support strategies. The paper group chose three support strategies, highlighting, dictionary use and note-taking (See Figure 1). Their results for HUC were 205 (M = 18.64, SD = 15.49). The use of HUC ranged among participants, from

zero to 50 instances. Ten paper text group participants used HUC. The paper text group's results for note-taking were 29 (M = 2.64, SD = 4.46). The use of note-taking ranged among participants, from zero to 14 instances. Seven paper text group participants used note-taking. The paper text group's results for English dictionary use were 3 (M = 0.27, SD = 0.90). The English dictionary was used by one participant three times. The paper text group's results for bilingual dictionary use were 124 (M = 5.64, SD = 8.22). The instances of bilingual dictionary use ranged among participants, from zero to 32 instances. Six paper text group participants used the bilingual dictionary.

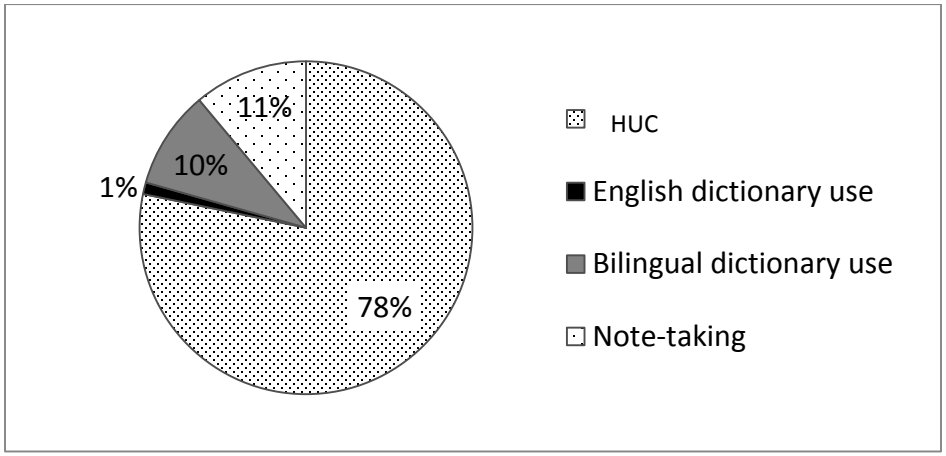

Figure 1. Mean incidences of support strategy uses for the paper text group.

E-book group support strategy use

The total incidences of support strategy use for the e-book group was 160 (M = 14.55, SD = 15.49), as shown in Table 3. The total support strategy use ranged among participants, from zero to 42 instances. Eight e-book participants used support strategies. The e-book group's results for HUC were 61 (M = 5.55, SD = 7.70), as seen in Figure 2. The use of HUC ranged among participants, from zero to 24 instances. Six e-book participants used HUC. Their total results for note-taking and for English dictionary use were 0. Their results for bilingual dictionary use were 99 (M = 9, SD = 10.28). The use of the bilingual dictionary feature ranged

among participants, from zero to 32 instances. Eight e-book participants used the bilingual dictionary.

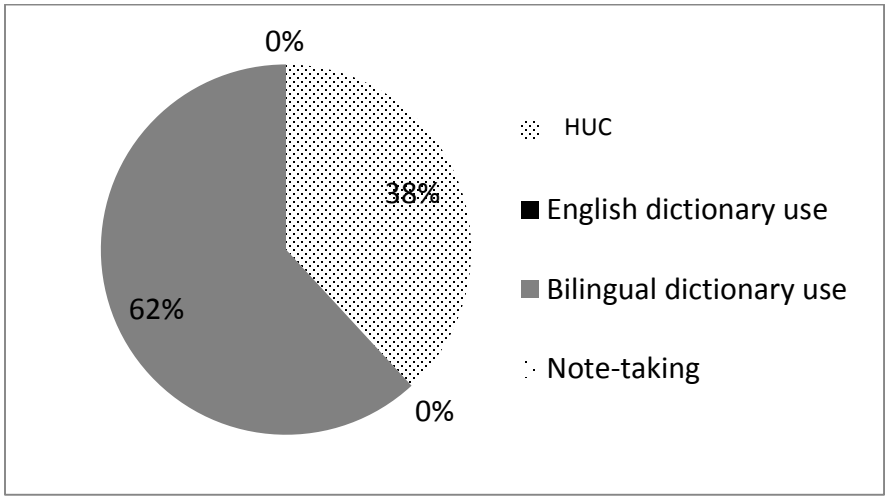

Figure 2. Mean frequencies of support strategy uses for the e-book group.

Comparison of strategy use between groups

Ten paper-text participants and eight e-book participants used support strategies. When comparing the two groups, the paper text group demonstrated 102 more incidences of support strategy use than the e-book group. The range of strategy use among all participants varied greatly in both groups. Four more paper text group participants used HUC than e-book group participants. The paper text group demonstrated 144 more incidences of HUC than the e-book group did, with a difference in means of 13.09. Seven paper text group participants and 0 e-book group participants used note-taking. The paper text group demonstrated more incidences of note-taking than the e-book group did, as the paper text group's total was 29 and the e-book group's was 0. The paper text group demonstrated more incidences of English dictionary use than the e-book group did, as the paper text group's total was 3 (by one participant) and the e-book group's was 0. Contrary to the other support strategy use results, two more e-book group participants than paper text group participants used the bilingual dictionary. The e-book group demonstrated

74 more incidences of bilingual dictionary use than the paper text group did, with a difference in means of 6.73.

Survey data

To supplement that strategy use data, I asked the students about their perceptions of their texts and strategy uses. First, I will present the paper text group survey data, followed by the e-book group survey data. After that, I will compare the two groups.

Paper text group survey data

According to the paper text group's self-reported information on the post-survey, the one participant who used the English dictionary said that he did not find it to be useful. Of the six paper text group participants who used a bilingual dictionary, four reported that they found it to be useful, while one reported it to not be useful, and the other one reported that he was not sure. When asked, "Would you use an electronic dictionary if it was possible?" nine participants responded with "yes," while one participant responded with "no," and another said "not sure." All 10 of the 11 participants who used HUC reported that they found that strategy to be useful. Seven paper text group participants reported to have used other strategies while reading, consisting of five who reported to use a problem-solving strategy, one who reported to use a global strategy, and one who reported to use a problem-solving strategy and a global strategy in combination.

Seven out of 11 of the paper text group participants reported that they currently are using an e-book for learning or that they have used one in the past for learning. However, when asked which they prefer to use when learning, only two out of 11 participants reported that they would prefer to use an e-book. Of nine participants who reported that they preferred to use a traditional paper book, the most common responses regarded the ease at which they could

underline/highlight, take notes, or look up information because it was more familiar. Of those who reported that they preferred to use e-books, the most common reason why was because they found it to be easier (easier to use the e-book and easier to use the built-in dictionaries).

E-book group survey data

According to the e-book group's self-reported data on the post-survey, all eight of the 11 participants who used the bilingual dictionary reported that they found it to be helpful to their understanding of the text. All six of the 11 e-book group participants who highlighted words while reading also reported that they found it to be helpful. Seven e-book group participants reported to have used other strategies while reading, consisting of one who reported to use a problem-solving strategy, four who reported to use global-strategies, and two who reported to use problem-solving strategies and global strategies in combination.

Four out of 11 of the e-book group participants reported that they currently are using an e-book for learning or that they have used one in the past for learning. However, when asked which they prefer to use when learning, seven out of 11 participants reported that they would prefer to use an e-book, two participants reported that they would prefer to use a paper book, and two participants reported that they were not sure which one they would prefer to use. Of those who reported that they would prefer to use an e-book book, the most common responses regarded the ease at which they could take notes and use the dictionaries, and that they found them to be less expensive than paper books. Of those who reported that they would prefer to use a paper book, the most common reasons why were because they found it to be easier to locate information, take notes, and underline/highlight.

Comparison of survey results between groups

In both groups, the majority of participants who used the bilingual dictionary reported that they found it to be useful. All of the participants who used underlining/highlighting found that strategy to be useful. No participants reported that using the English dictionary was useful; however, it must be noted that only one participant from the paper text group attempted to use it. The majority of participants from both groups (63.64%; seven from each group) reported to use other strategies, such as problem-solving strategies or global strategies.

When participants discussed whether they preferred e-books or paper texts, the participants from the e-book group reported to prefer e-books more, and the participants from the paper text group reported to prefer paper texts more. Despite what group a participant was in, the most frequently provided reasoning for preferring one interface over the other was that the interface allowed them to use support strategies with greater ease.

Discussion

An interesting finding here is that though average incidences of support strategy use and average post-test gains varied between groups, average delayed post-test scores did not.

Reading comprehension discussion

The data support my hypothesis for Research Question #1, which was "I expect that the reading comprehension of ESL learners who read using e-books will be similar to the reading comprehension of ESL learners who read using paper texts, contrary Kang, Wang, & Lin (2009), Kress (2003), Lam et al. (2012), Mac William (2013), and Wilson (2003).

Independent-samples *t*-test results suggest that there was a difference between the two groups in background knowledge (as measured by the pre-test); however, this is attributed to one more accurate guess in a true/false multiple-choice test. Because of the random assignment to groups of a small sample pool and the possibility of successful guessing, I conclude that these

results are not meaningful. Independent-samples *t*-tests also revealed that there was no significant difference between groups in either the post-test or the delayed post-test. These results echo the arguments of scholars who claim that reading from electronic interfaces will not significantly impact reading comprehension (Horning, 2003; Kol & Schcolnik, 2000).

Strategy use discussion

The results do not support my hypothesis for Research Question 2, which was "I expect that, compared to reading with paper texts, reading with e-books will not affect the types of support strategies that ESL readers use because the four types of support strategies investigated in the current study are able to be implemented in both types of reading interfaces."

The e-book group completely avoided the use of the English dictionary feature available in the e-book, and used the bilingual dictionary feature exclusively instead. It must be noted that the English dictionary was infrequently used by the paper text group as well, as only one participant used it three times (See Figure 1). These results suggest an overall trend of the high-intermediate level ESL participants in this study relying primarily on L1 – L2 transfer when they encounter new words, as opposed to L2 word-mapping.

Similarly, the e-book group completely avoided taking notes via the note-taking feature available in the e-book. This may be due in part to the limited ways in which the participants were able to take notes with the current e-book, as they could only insert typed notes in English and not draw or handwrite in any way on the text.

These results regarding my hypothesis to Research Question #2 do not completely align with research from Huang et al. (2009), which found that the when L2 learners read an electronic text, the most frequently used support strategies involved using an English dictionary, followed by translating, highlighting, and note-taking, respectively. The results do not align with research

from Reinking and Rickman (1990) either, who found that students who use e-texts are much more likely to look up word definitions than students who use paper texts. The results also do not completely align with Huang 2013b, claimed that L2 learners who use e-texts are much more likely to use the English or bilingual dictionary options.

The results not completely support my hypothesis for Research Question 3, which was, "I expect that, compared to reading with paper texts, ESL learners who read with e-books will use a greater frequency of some support strategies, such as looking up words in the dictionary and bilingual dictionary, following Huang et al. (2009), Huang (2013b), and Reinking & Rickman (1990)." The results that support the first part of Hypothesis 3 are that, as a group, the e-book participants demonstrated a greater frequency of bilingual dictionary use. The results that conflict with the second part of Hypothesis 3 are that overall, the paper text group demonstrated more instances of support strategy use than did the e-book group.

These findings support the notion that ESL learners struggle with support strategy use when reading e-books. The current study's findings do not align with Huang et al. (2009), and Huang, (2013a, 2013b), who found that students use support strategies much more frequently when reading e-texts. However, the results of the current study do reflect those of Chou (2012), whose participants reported that reading on a computer screen limited their use of strategies.

Support strategy data revealed a great range in its use among participants, regardless of the interface used. For the paper text group, the standard deviations of the overall support strategy use and HUC are nearly as high as their means. Data from the paper text group's use of note-taking, English dictionary use, and bilingual dictionary use reveal standard deviations that are greater than their means. The data on the e-book group's support strategy use shows even greater range. For total support strategy use and each sub-type of support strategy used, which

are HUC and bilingual dictionary use, the standard deviations were greater than the means. These data suggests that individual preference in strategy use plays a greater role than the interface being used.

Survey Results Discussion

When participants discussed whether they preferred e-books or paper texts, the participants from the e-book group reported to prefer e-books more, and the participants from the paper text group reported to prefer paper texts more. Despite what group a participant was in, the most frequently provided reasoning for preferring one interface over the other was that the interface allowed them to use support strategies with greater ease. This follows Appropriation Theory (Papadima-Sophocleous & Charalambous, 2014) in that the participants in both groups found the interface that they used to be more familiar and thus more useful.

Pedagogical Implications

Based on these results, I believe that second language programs may wish to reconsider incorporating e-books into their curricula. The use of e-books does not affect students' reading comprehension, and using them may offer additional benefits, such as reduced cost (Miller, 2015) and burden (Kol & Schcolnik, 2000) for the students. Furthermore, claims from scholars such as Chou (2012), Kol & Schcolnik (2000), Mac William (2013), and Mercieca (2003) indicate that e-books may replace paper texts in academia in the future; therefore, second language programs who adapt to this change early may seem more technologically current and therefore more appealing to students.

Concerning support strategy use, the implications of the current study align with Anderson (2003), who suggests that support strategies are implemented differently with e-books, and that L2 instructors should teach these strategies to their students as separate from support

strategies used with paper texts if the students are to appropriate the technology effectively. The current study's findings suggest that this is especially the case with note-taking and English dictionary use, as e-book participants avoided these support strategies. However, results from the current study also suggest that once students become familiar with e-books and appropriate them, student may prefer to use them over paper texts because of the ease in which certain support strategies can be used.

Conclusion

The results of this research contribute to the fields of SLA and TESOL pedagogy in that they provide insights into the ways in which L2 learners use reading strategies with technological interfaces, an area of scholarly interest that has received little attention to date. This was the first study to date that incorporated a contemporary e-book application in accompaniment with an e-book specifically designed for intermediate ESL learners. The study's design, implementation, and significance were guided by a sociocultural, interactionist framework and Appropriation Theory.

This study explored whether e-books, as compared to traditional paper-texts, affect reading comprehension and strategy use among 22 high-intermediate ESL learners. Data was collected through reading comprehension tests and surveys. The findings are that, though strategy use and frequency varied between groups, reading comprehension did not. ESL programs now have findings to further justify the incorporation of e-books into their curricula.

There exist several limitations to the current study. The study did not include stylus use and it is suggested that future studies provided them because the use of a stylus as a familiar tool may encourage more naturalistic support strategy use; therefore, it could have affected the use and frequency of support strategy use of the experimental group. Another limitation is that, at

the time of the study, the e-book application did not include an Arabic-English bilingual dictionary. It is suggested that in future studies, an e-book reading application with a greater range of languages in its bilingual dictionary feature be used. In addition, a more rigorous reading sample is encouraged for future studies, as it may encourage participants in both groups to use a greater array and frequency of strategies.

This research suggests that though e-books impact strategy use and frequency, they do not significantly impact reading comprehension. However, as Anderson (2003) suggests, due to the rapidly changing technology, the research must continue to investigate the benefits and hindrances of such devices for L2 learners.

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Appendix A: Demographic Survey

Demographics Survey

Enter ID Number

What is your age?

Male or female?

What is your home country?

What is your native language?

Do you speak any other languages?

What will you study after the IEI?

How long have you studied English?

How long have you lived in an English-speaking country?

Submit

Never submit passwords through Google Forms.

Appendix B: Reading Comprehension Pre-test, Post-test, and Delayed Post-test

Test

1. **Enter ID Number**

   _____

2. **For test administrator, write Pre OR Post OR Delayed**

   _____

3. **Select "True" or "False"**
   Bananas are cultivated in only a few tropical countries.
   Mark only one oval.

   ◯ True
   ◯ False

4. Commercially grown bananas are propagated by planting banana seeds.
   Mark only one oval.

   ◯ True
   ◯ False

5. Bananas are classified as "berries."
   Mark only one oval.

   ◯ True
   ◯ False

6. A bunch of bananas is called a "palm."
   Mark only one oval.

   ◯ True
   ◯ False

7. Bananas come in many different colors and sizes.
   Mark only one oval.

   ◯ True
   ◯ False

8. **Choose the Correct Answer**
Bananas were first grown in:
Mark only one oval.

- China
- Malaysia
- Brazil
- Spain and Portugal

9. Bananas were commercialized by:
Mark only one oval.

- Portuguese and Spanish explorers
- Chinese fruit growers
- The United Fruit Company
- Chiquita Banana Company

10. The most popular variety of banana is the:
Mark only one oval.

- Goldfinger
- Dwarf Cavendish
- Devonshire
- Costa Rican

11. This country is the world's top producer of bananas:
Mark only one oval.

- India
- the Phillipines
- Brazil
- Mexico

12. Technically, banana plants are:
Mark only one oval.

- tropical trees
- bushes
- tall grasses
- perennial herbs

Appendix C: Paper Text Strategy Lesson

Instructional Lesson on Traditional Text:

Give the participant the paper-based passage, the bilingual dictionary, the English dictionary, the pens, pencil, and highlighters to use.

Tell participant that they may mark anywhere on the paper, as we have many copies and this one is for them; it will not be reused.

Suggest that they mark on the paper and take notes the way they usually do (for vocabulary words, new words, main ideas, or other important concepts, etc.).

Remind students about the types of strategies available and how to use them.

Remind the participant that s/he may not use an electronic dictionary or smart phone during the reading session.

Tell the participant that s/he will not be able to refer to the reading passage then s/he takes the post-test.

Ask the participant if s/he has any questions.

Appendix D: E-book Strategy Lesson

Instructional Lesson on Electronic Textbooks:

* Throughout tester allows student to click and use features

Today, you will have a short lesson on how to use an electronic textbook.

We will look at dictionary use with a bilingual option, note-taking, highlighting text, and text size and background color.

First we will practice finding dictionary definitions.

Tap and hold your finger on the first word, "banana."

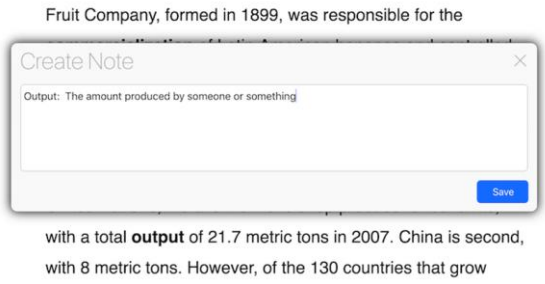
Here you can read the definition of a word, so while reading the passage if you read a word you don't know, please view the definition. At the bottom of the screen, tap on the dictionary box.

If you have difficulty reading the definition in English, you can possibly read the definition in your native language.

To do this, swipe the dictionary box to the left to view a dictionary in your native language. You will need to change the language on the bottom right to your native language.

Tap and hold on "banana" again and you will also see an option to add a note.

If you are reading and you would like to make a note of your understanding or write any thing you are thinking, click on the note taking picture on the right side of the pop-up box.

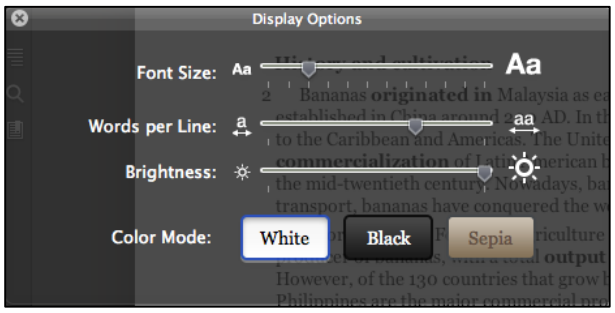


Please type note now. Tap to save when you are finished. Do you see the blue box? Tap on this to see your notes. Click "x" to exit.

Now highlight the first sentence by holding your finger on banana and dragging it to the first period. You can also highlight by tapping and holding the word. The box will pop up and you can choose the color.

If you would like to see everything you written in notes and highlighted, you can click on the lined page picture on the right hand side.

You can also change the text size, words per line, and background color to suit your preference by clicking on the "Aa" icon.



Please click through each background color.

Now change the font size by clicking the smaller and bigger "Aa" buttons.

You can also change the font to your favorite.

Finally to change the page, you will see arrows on each side of the page to click to the next or previous page.

Do you have any questions?

* Remind the participant that s/he may take as long as necessary to read and mark the passage (if s/he chooses to mark it).

*Remind the participant that s/he may not use a smart phone or other supplemental devices while reading the text.

* Remind the participant that s/he may not refer back to the reading passage when s/he takes the post-test.

Appendix E: Paper-based Reading Passage

History and cultivation

2 Bananas **originated in** Malaysia as early as 2000 BC, but the first banana plantations were established in China around 200 AD. In the early 1500s, the Portuguese and Spanish introduced bananas to the Caribbean and Americas. The United Fruit Company, formed in 1899, was responsible for the **commercialization** of Latin American bananas and controlled most of the trade in tropical fruit into the mid-twentieth century. Nowadays, bananas are traded as a **commodity**. With the aid of refrigerated transport, bananas have conquered the world.

3 According to the Food and Agriculture Organization of the United Nations, India is the world's top producer of bananas, with a total **output** of 21.7 metric tons in 2007. China is second, with 8 metric tons. However, of the 130 countries that grow bananas, Mexico, Costa Rica, Brazil, Colombia, Ecuador, and the Philippines are the major commercial producers.

4 Bananas do not grow on a tree, as most people imagine, but on a sturdy plant that can reach 6 to 7.6 meters high, with large leaves up to 0.6 meters wide and 2.75 meters long. In fact, the banana plant, Musa acuminata, is the world's largest perennial herb. Cultivation is best suited to tropical and subtropical areas with ample water, rich soil, and good drainage. Because bananas have been **cultivated** to become seedless, commercially grown bananas are **propagated** through division, a process of separating offshoots, or "pups," from the mother plant.

5 Classified as a berry rather than a fruit, the banana develops in a heart-shaped flower bud and forms **bunches**, called a "hand," of 10 to 20 individual "fingers" weighing 20 to 45 kilograms. Although we picture bananas in a bright yellow skin with brown spots, turning to a solid brownish black as they **ripen** and sweeten, they also come in green, purple, red, orange, pink, black, and striped jackets, and a variety of sizes. Of the 1,200 varieties of bananas, the most widely **consumed** banana is the Dwarf Cavendish (Cavendish for short), named for William Cavendish, 6th Duke of Devonshire, who cultivated an early specimen in his hothouses.

Appendix F: E-book Reading Passage

B_6, C, and K; and essential minerals. Pineapple is a natural healer **packed with** vitamin C and bromelain, a potential anti-inflammatory. The list of healthy, healing fruits goes on and on, but when it comes to health, popularity, **versatility**, and overall usefulness, none can beat the banana.

History and cultivation

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most of the trade in tropical fruit into the mid-twentieth century. Nowadays, bananas are traded as a **commodity**. With the aid of refrigerated transport, bananas have conquered the world.

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banana plant, *Musa acuminata,* is the world's largest perennial herb. Cultivation is best suited to tropical and subtropical areas with ample water, rich soil, and good drainage. Because bananas have been **cultivated** to become seedless, commercially grown bananas are **propagated** through division, a process of separating offshoots, or "pups," from the mother plant.

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and sweeten, they also come in green, purple, red, orange, pink, black, and striped jackets, and a variety of sizes. Of the 1,200 varieties of bananas, the most widely **consumed** banana is the Dwarf Cavendish (Cavendish for short), named for William Cavendish, 6th Duke of Devonshire, who cultivated an early specimen in his hothouses.

Nutritional composition

6 A nine-inch-long banana is 75 percent water and 35 percent skin, and has between 110 and 140 calories. Bananas contain three sugars: sucrose, fructose, and glucose, making them an instant and **sustained** energy food. The following table lists only some of the most important nutrients in a banana.

Appendix G: Observation Notes

ID number: _____
Start Time: _____ Finish Time: _____

Dictionary Use: (List any words the student looks at for definition)

Bilingual Dictionary Use: (List any words the student looks at for definition)

Highlighting: (List any words, phrasing, etc. the student highlights or how student uses highlighting as a strategy)

Notes Added: (Describe any way the student took notes)

Background color used: (List any changes the student makes to the background color and when)

Font changes: (List any changes the student makes to the font and when)

Appendix H: Post-survey for Paper-based Group

Post Survey for traditional book (new)

Enter ID Number

1. Did you enjoy reading this text?
Please write "yes" or "no," then explain why.

2. The text size was:

- too big
- good
- too small

3. How do you feel about the white background color?

- I liked it.
- It was OK.
- It strained my eyes.

4. Did you use the English Dictionary?

- Yes
- No

5. Was the English dictionary helpful for your understanding?
Please write "yes" or "no," then explain why.

6. Did you use the bilingual dictionary?

- ○ Yes
- ○ No

7. Was the bilingual dictionary helpful for your understanding?

Please write "yes" or "no," then explain why.

8. Would you use an electronic dictionary if it was possible?

Write "yes" or "no," then explain why.

9. Did you highlight or underline words?

- ○ Yes
- ○ No

10. If you highlighted or underlined words, was it helpful?

Explain why.

11. Do you currently use electronic textbooks for learning?

Write "yes" or "no," then explain why.

12. Have you used electronic textbooks in the past for learning?

Write "yes" or "no," then explain why.

13. Which one do you prefer to use when learning?

- ebooks
- traditional books

14. Why do you prefer to use them?

15. Did you have any problems while reading this text?

Is there anything you would change?

16. Did you use any other strategies while reading?

List them.

Reading time:

Submit

Never submit passwords through Google Forms.

Appendix I: Post-survey for E-book Group

Post Survey

Enter ID Number

1. Did you enjoy using the e-book?

Please write Yes or No, then explain why.

2. Which background color did you use most of the time?

- White
- Sepia
- Inverse

3. Do you think changing the background color helped you focus on the reading?

Please write Yes or No, then explain why.

4. Did you change the font size or font type when you read?

Please respond with "yes" or "no," then explain why.

5. Did you click on any words to see the definition?

- ○ Yes
- ○ No

6. Was the dictionary (definition) helpful for your understanding?

Please write Yes or No, then explain why.

7. Did you use the bilingual dictionary?

Please write Yes or No, then explain why.

8. If you used the bilingual dictionary, was it helpful to your understanding?

Please write Yes or No, then explain why. If you did not use the bilingual dictionary, please do not answer this question.

9. Did you highlight or underline words while reading?

- ○ Yes
- ○ No

10. If you highlighted or underlined words, was it helpful?

Please explain.

11. Did you use any other strategies while reading?

List them.

12. Do you currently use electronic textbooks for learning?

13. Have you used electronic textbooks in the past for learning?

Please write Yes or No, then explain why.

14. Which one do you prefer to use when learning?

- [ ] ebooks
- [ ] traditional books

15. Why do you prefer to use them?

16. Did you have any problems while using the e-book?

Is there anything you would change?

17. Reading time:

Submit

Never submit passwords through Google Forms.

Appendix J: Sample E-book Screen Shot

Reading text

1 An apple a day keeps the doctor away. In winter, the antioxidant vitamin C in oranges and citrus fruits **boosts** the immune system. Grapes are high in **nutrients**; vitamins B_1, B_2, B_6, C, and K; and essential minerals. Pineapple is a natural healer **packed with** vitamin C and bromelain, a potential anti-inflammatory. The list of healthy, healing fruits goes on and on, but when it comes to health, popularity, **versatility**, and overall usefulness, none can beat the banana.

History and cultivation

2 Bananas **originated in** Malaysia as early as 2000 BC, but the first banana plantations were established in China around 200 AD. In the early 1500s, the Portuguese and Spanish introduced bananas to the Caribbean and Americas. The United Fruit Company, formed in 1899, was responsible for the **commercialization** of Latin American bananas and controlled most of the trade in tropical fruit into the mid-twentieth century. Nowadays, bananas are traded as a **commodity**. With the aid of refrigerated transport, bananas have conquered the world.

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Appendix K: SPSS Independent t-test Results for the Pre-test

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre	1	11	6.09	1.921	.579
	2	11	4.27	2.149	.648

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre	Equal variances assumed	.004	.950	2.092	20	.049	1.818	.869	.005	3.631
	Equal variances not assumed			2.092	19.754	.050	1.818	.869	.004	3.633

Appendix L: SPSS Independent t-test Results for the Post-test

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Post	1	11	11.09	4.134	1.246
	2	11	8.91	2.119	.639

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post	Equal variances assumed	4.804	.040	1.558	20	.135	2.182	1.401	-.740	5.104
	Equal variances not assumed			1.558	14.916	.140	2.182	1.401	-.805	5.169

Appendix M: SPSS Independent t-test Results for the Delayed post-test

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Delayed	1	11	8.27	3.289	.992
	2	11	8.27	3.467	1.045

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Delayed	Equal variances assumed	.004	.953	.000	20	1.000	.000	1.441	-3.006	3.006
	Equal variances not assumed			.000	19.945	1.000	.000	1.441	-3.006	3.006